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EDITORIAL NOTES

PRE-VICTORY LIGHTING

SOME of the most irksome features of the black-out are to disappear when double summer time ends next Sunday.

Public lighting, in a modified form, will be permitted in many parts of the country, and the screening of domestic lighting everywhere, except in a few still restricted areas, will be much less drastic than it has been throughout the war period. Even if these relaxations are not so universal as some of the more sensational newspapers have led their readers to expect—and there are large stretches of the country that are, for the time being, to remain without public lighting—they are welcome as an indication of the official view of our greater immunity from air attack and as an opportunity partially to lift the veil on the preparations the Gas Industry is making to resume one of its outstanding services to the community.

The reaction to the announcement is, of course, obvious and wholly understandable. The point is to what degree and how soon it will be practicable to carry intention into effect. In common with other vital industries, throughout the war years the Gas Industry has been called upon to meet ever-increasing priority demands for heat with ever-diminishing labour force. Unconspicuously—the more so through its virtual absence as an illuminant in the streets—it has fulfilled these demands for heat in home and factory ; and it will not be lacking in eagerness to satisfy within permissible limits the cry for more light. Regarding these limits there would appear as yet to be no very clear definition, but an official statement issued by the Home Office last Thursday announced that it was the intention to abolish the black-out all over the country as soon as circumstances permit. In the meantime the following relaxations will take effect on Sept. 17. Window black-out will be replaced by "half-lighting" over the whole country except in a few special coastal areas. Under the new requirement windows other than skylights will only need to be curtained sufficiently to prevent objects inside the building from being distinguishable from the outside. This will enable ordinary peace-time curtains or blinds to be used, except the flimsiest kind, and from the streets a diffused light will be seen. On an air-raid warning complete obscuration will be required either by drawing black-out curtains or extinguishing the lights.

"Street lighting of much higher standards will also be allowed" the statement continued. "It will be introduced stage by stage as circumstances permit and as it becomes practicable. Instructions are being sent to all lighting authorities about the areas in which street lighting will be allowed at once. Where street lighting has a master switch and is capable of extinction on a warning, a standard comparing favourably with much of the pre-war street lighting will be allowed. Where the lighting cannot be put out at once a standard roughly equivalent to pre-war side street lighting will be allowed. In all cases lamps will be screened above the horizontal. Greatly improved external lighting for vital work in docks, shipyards, railway marshalling yards, &c., will be allowed."

The partial lifting of the black-out has not found the Gas Industry unprepared. For a long time it has been getting ready for lighting up, and there has been close collaboration between the Industry, the Government Departments concerned with home security, labour, and the supply of materials, and the local authorities which are primarily responsible for public lighting. Obviously more attention has been paid to the problems involved in the full restoration of lighting than to those of partial lighting during an indefinite, rather unexpected, but we hope very short, period, and in some ways—ignoring for a moment the larger question of coal supplies—the Industry is probably better prepared for a complete rather than a partial resumption of lighting. In common with the Association of Public Lighting Engineers it has consistently encouraged the local authorities to keep their lighting equipment in some reasonable state of repair. A few councils have been short-sighted enough to neglect their equipment to such an extent that replacements will present a serious problem, both through lack of supplies and scarcity of labour, but most authorities have carried out at least a measure of maintenance throughout the war and will be able to light up with very little delay. Wherever gas undertakings have been directly responsible they have seen to it that gas and reflecting surfaces have been cleaned, parts that would corrode and "stick" have been greased, corrodible metal has been painted, and parts liable to deterioration if left in the streets have been stored. Lighting staffs, largely diverted to air raid duties at critical periods, have been switched back during the lulls to the overhaul and maintenance of lamps and fittings. Broad recommendations have been issued by The Institution of Gas Engineers, to be followed by more detailed instructions as circumstances permit. The effect of all this is that the Industry is ready to provide a very big percentage of normal lighting as soon as the edict goes forth, and to complete the job within a matter of a few days. In the area served by the Gas Light and Coke Company, for example, it is reliably estimated that 75% of the normal lighting will be in operation ten days after the end of hostilities.

Before the war there were about 750,000 public gas lamps in the country, of which some 150,000 have been converted to A.R.P. "starlight" lighting with an intensity of 0.0002 foot candles. Allowing for lamps put permanently out of action, there are probably 600,000 available for lighting as soon as the ban is completely lifted. For security reasons no statistics have been disclosed with regard to the scope of the new modified lighting, but if, for the sake of illustration, we assume that one half of the available lamps are put into use, we shall get some sort of a picture of the task to be achieved. The Home Office announcement provides for two levels of lighting. Where there is central control and lights can be extinguished immediately on receipt of a warning of an imminent air raid, an illumination *not exceeding* 0.2 foot candles on the ground may be permitted. Where central control is not available an illumination *not exceeding* 0.02 foot candles may be permitted, in which case the lamps will be allowed to continue in operation throughout a raid. Schemes affording the higher illumination cannot be operated by the Gas Industry at present, since such central control systems as exist are actuated by pressure devices, and even the small time lag necessary to bring them into operation puts them outside the "immediate extinction" qualification. In both cases the light is required to be so screened that no direct light is visible above the horizontal.

Adaptation of existing lamps to this pre-victory lighting standard would involve substantial labour. High-mounted units designed for 12-mantle clusters would have to be converted to light only two of the twelve ; the other ten nozzles would have to be sealed off, the burners readjusted, and the upper part of the lanterns painted out to screen all light above the horizontal. For the lower mounting heights, equivalent to the average pre-war side street lighting, it is contemplated that one Bijou mantle would be used instead of the usual two, and besides the screening of the top, the bottom would have to be screened to obviate a pool of light in excess of the permitted intensity on the ground. Fittings designed to give an illumination at the specified mounting heights and spacings of 0.02 foot candles have been widely used for A.R.P. lighting in railway

yards and similar places where this standard was permitted. There are no technical difficulties about their design, but it is an open question whether, for what is clearly nothing more than a short interim period, it would be worth while interrupting more urgent work to produce these fittings in the time and in the quantities necessary to deal with the present situation.

Where "starlight" fittings, which gave a maximum illumination of 0.0002 foot candles, are available, a ten-fold increase can be provided by removing the masks, and this can be achieved without any increase in fuel consumption. It has been urged that this should be done wherever possible, for although the full measure of alleviation permitted will not be achieved, the additional light provided will satisfy the majority of people for the interim period.

As we have already indicated, the Gas Industry is ready and eager to go ahead with the restoration of public lighting. Like the rest of the community it looks forward to the complete lifting of the black-out. In the meantime its problems are to learn where modified lighting is to be permitted; to discover to what extent the local authorities in those areas are prepared to commit themselves to a temporary system involving a step backwards in the general movement towards full lighting and the expenditure of labour and materials on conversions which will become obsolete on the day the war ends; and so to plan the temporary lighting that it will not hinder the introduction of complete lighting.

There is just one further aspect of the matter which strikes us as having an important bearing. The Minister of Fuel and Power has implored us to save coal, offering us small hope regarding next winter's domestic supplies. Before the war sales of gas for street lighting (which had more than doubled since the end of the Great War) amounted to nearly 15,000,000,000 cubic feet, practically all of which gas was made from coal. Until the coal situation improves, will there be a necessary exercise of caution in returning to wholesale and full pre-war illumination of our streets, and an attempt to balance the relative effects of street lighting on cheerfulness and safety, and of heat in the home on health, comfort, and moral? Will the final outcome be the institution of a "hasten-slowly" policy as being in the best all-round interests of the community? It would be a mistake, we think, to disregard this consideration in the joy which all share about the relaxation of the black-out.

Personal

Mr. J. A. BRENTNALL is retiring under age limit from the position of Works Superintendent at the Dartford Works of the South Suburban Gas Company. He has served the Company for 15 years and has spent 34 years in the management of gas undertakings in various parts of the country.

Obituary

The death has occurred of Mr. WILLIAM WILSON, late Gas Engineer and Manager at Burton-on-Trent and formerly at Falkirk and Kirkintilloch. Deceased was the son of the late Thomas Wilson, for many years Engineer and Manager at Coatbridge.

Letters to the Editor

Gas in Naples

DEAR SIR,—I thought the attached clipping from the *Union Jack*, our Forces newspaper, might be of some interest to you as giving an idea of the state of gas services in large Italian towns to-day.

I rather think that in Rome the situation is fairly normal since the city has not been nearly so affected by the war, but apart from that this is the first sign or mention of gas that I have seen since landing in Italy.

C.M.F.
Aug. 7, 1944.

Yours faithfully,
G. DOUGLAS GILL,
Major.

"The gas service will be restored on August 15 at 12.00 hrs. to the following section of Naples: To the buildings of the right side of Corso Umberto I, starting at Piazza Garibaldi, and the area taken in by the following streets—from Corso Umberto to Via Duomo, Via Tribunali, Via Francesco del Giudice, Via Sapienza, Via Constantinopoli, Via S. Sebastiano, Via M. Semmola, Piazza Oberdam, Via C. Battista, Via Monetloiveto, Via Guglielmo San Felice, Piazza Bovio.

"People living in these locations are forbidden the use of gas before 12.00 hrs., Aug. 15, states A.M.G. At 08.30 hrs. the Gas Company operators will start to clean out the pipelines in these streets. This work will continue up to 11.00 hrs. It would be dangerous for anyone, therefore, to attempt to use this utility before 12.00 hrs. Gas service for cooking purposes only will be carried on from 06.30 hrs. to 08.00 hrs., and from 11.30 hrs. to 14.00 hrs. Gas is to be used for cooking purposes only, water heaters and other utensils are prohibited. The use of prohibited utensils will tend to vary the gas pressure, causing serious danger.

"Each consumer must shut off the main gas jet and all other jets, which must remain closed until 12.00 hrs. on Aug. 15. After 12.00 hrs., open the jets, allowing the excess air to escape, but not lighting the burner, until the presence of gas has been verified.

"After lighting the burners, watch them closely to see if they are in good working order. Do not leave any gas flame or jet unattended."

Complete Gasification

DEAR SIR,—Mr. Masterman brings some interesting statements to bear on the principal points on which I sought information through my Paper to the Midland Junior Gas Association.

He says: "The sale of coke recovers some net revenue towards meeting the total costs of operation of the gas undertaking." (The last five words I take to mean the costs of gas production.) In other words Mr. Masterman is carrying on the old tradition associated with the production of gas for flat or argand flames for lighting—a long period when coke was sold at about 4s. per ton and the production of illuminating power gas without pre-aeration was the order of the day, 10,000 cu.ft. of so-called 16/17 candle-power gas from one ton of coal.

Thus he goes to the root of the method on which the whole Gas Industry costs its gas for coal:

Cost of one ton of coal, 35s.	420 pence.	
Less cost of coal for producing coke and tar . . .	280 „	
Net cost of coal . . .	140 „	the actual cost of $6\frac{2}{3}$ cwt. of coal.

Net cost per gas therm for coal $\frac{140}{67\frac{1}{2}} = 2.074$d.

The production of coke and tar cost 280d. (the cost of $13\frac{1}{3}$ cwt. of coal) and this cost, representing two-thirds of the raw coal processed, is ignored.

Here is laid bare the biggest snag of the present process of gas production. The make of gas per cwt. of coal processed is $\frac{67\frac{1}{2} \text{ cwt.}}{20}$ = 3.375 therms per cwt. When 140d. is taken as the coal used to produce $67\frac{1}{2}$ therms, the rate per cwt. becomes $\frac{67\frac{1}{2}}{6\frac{2}{3}} = 10.125$ therms per cwt., which is entirely untrue. Accountancy cannot allow such a travesty of the truth. The make per cwt. by complete gasification $= \frac{202\frac{1}{2}}{20} = 10.125$ therms.

By the present process of gas production every particle of the coal processed adds its quota of gas, of coke, and of tar to the $67\frac{1}{2}$ gas therms. This fact cannot be disputed. The cost of coal gas production cannot be isolated or taken separately. The present process is a combination process for the production of gas, of coke, and of tar. No one product can be produced alone.

When the 140d. is taken as the net cost of coal it postulates that $67\frac{1}{2}$ gas therms are produced from $6\frac{2}{3}$ cwt. of coal, or at the same rate of gas therms per cwt. as are produced when $202\frac{1}{2}$ gas therms are assumed to be produced per ton of coal. $\frac{420}{202\frac{1}{2}} = 2.074$d. per gas therm $= \frac{140}{67\frac{1}{2}} = 2.074$d.

Will Mr. Masterman reconcile these figures and do away with the confusion they cause?

The figure he leaves out of his calculation is $\frac{280}{67\frac{1}{2}} = 4.148$d. per gas therm, the cost of coke and tar per gas therm produced, the error caused being no less than 4.148d., or two-thirds of the total cost per gas therm of $\frac{420}{67\frac{1}{2}} = 6.222$d. per gas therm for the gas, the coke, and the tar produced.

Tar production cannot be avoided, but the production of coke is another matter. Coke so far as gas-works to-day are concerned is the result of the incomplete gasification of coal. It is this incomplete

gasification by the present process which places the Gas Industry in its present parlous condition.

The figures given show that if it were possible to gasify completely 13½ cwt. of coal assumed to be processed for the production of coke and tar, 13⅓ by 10.125 therms per cwt. = 135 therms. 135 plus 67½ provides the sum of 202½ therms per ton and proves to that extent the figures used.

Can the Gas Industry afford to sell the raw material from which 135 extra gas therms are producible as coke at coke prices? Is it not passing strange that the complete gasification of 6⅔ cwt. of coal would produce 67½ gas therms. 10.125 by 66⅔ = 67½ gas therms? In other words, the Gas Industry at present is processing 3 tons of coal to produce a given unit of gas when one ton is capable of producing it.

The other points of interest in Mr. Masterman's letter for which I am very indebted to him I will deal with in the near future, when I hope Mr. Masterman will have settled my hash on the foregoing—and on which (to me) the life or immediate decline of the Gas Industry of the country depends.

Without respect for the truth, right and equity cannot exist, and thus confusion ofttimes ensues.

Yours faithfully,
GEORGE HELPS.

Sept. 3, 1944.

P.S.—It should be obvious to the accountant or any man of figures to see that by the present method the cost of one-third of a ton of coal, 140d., is represented as the total cost of coal, from which 67½ gas therms are produced. I venture to state that this is impossible for any man to establish as a fact. No other subject should be allowed to take the stage until an acceptable statement on the fact is definitely made. This is not the first time I have made such a suggestion. G.H.

Further A.M.C. Planning

DEAR SIR,—Your Editorial under this title on Aug. 30 was fair comment on a most controversial matter—namely, the aims of the A.M.C. You say in effect the recommendations will not appeal to the efficient and vigorous smaller municipal gas undertakings any more than to the private companies. The absolute truth in such issue cannot be fully established (without perhaps a secret ballot), but it is believed your statement conveys the truth. The smaller undertaking doubts very much the competence of the A.M.C. to pass judgment on the whole question of Gas Industry planning. There are only some 40 or 50 City and County Boroughs with experience of gas undertakings, and from the general line of A.M.C. policy, "that of the all-purpose local authority," it is more than doubtful whether the Report is a reliable guide to what is best for the gas consumer. The consumer is very interested in service and price, but very little in ownership.

The A.M.C. is more concerned with the individual areas of its own members than the gas consumer, and it would be as well to remember that the Board of Trade addressed itself to the *Gas Industry* in 1941, asking us to consider ways to benefit the gas consumer.

Yours faithfully,
Sept. 6, 1944. "UPHOLDER."

DEAR SIR,—Are you not a little too sarcastic about the A.M.C. Report? After all, their criticism of the holding company is quite sound and "in the final count" I should say that "the greatest possible measure of freedom" is as likely to be left "to those who really understand the business" by a Joint Board as by a Board of Directors, and more likely than by any Single Authority.

Amalgamations on the geographical basis are most likely to be practicable by way of the Joint Board, in which local corruption appears to cancel out. With regard to the capitalist, defects in the company-owned section of the Industry are not so much due to his "depredatory instincts" as to his exaggerated conservatism and want of imagination. The only way out seems to be some form of strong central control.

Yours faithfully,
Sept. 8, 1944. "BORED WITH INEFFICIENCY."

A General Meeting of the Wales and Monmouthshire Association of Gas Engineers and Managers will be held on Sept. 28 at 11 a.m. at the South Wales Institute of Engineers, Park Place, Cardiff. The chair will be taken by the President, Mr. D. Muir, and the President-Elect, Mr. W. T. Kenshole, will be inducted to office. Following luncheon at the Park Hotel, the meeting will be resumed at 2.30, when a joint Paper on "Area Gas Supply" will be given by Messrs. W. Hodkinson and H. B. Taylor. The Paper will be followed by a discussion.

The Minister of Fuel and Power has authorized an increase of a penny a therm in the price of gas supplied by the South Metropolitan Gas Company. This increase is consequent on further increases in the costs of production, including the recent increase in the price of coal, and will have effect from meter readings taken on and after Sept. 18.

Relaxation of the Black-out

Street Lighting Plans

Announcement of the Government's decision to relax the black-out has, of course, met with the warmest of welcomes, though to what extent street lighting will be possible depends on what is meant by lighting of a "much higher standard." A general Editorial Comment appears on an earlier page, and we give here first reactions to the announcement from various towns:

Manchester.—Gas lighting services are being overhauled, and improvement will be possible by Sept. 17, in spite of the great handicap due to shortage of labour and material.

Salford, it is understood, will be able to restore street lighting on all the main traffic routes to "something very near normal" in two or three days.

Liverpool: The modified street lighting in the centre of the city can be improved at once, and it is hoped to "get the main roads ready" by Sept. 17.

Oldham: Most of the lamps have been prepared, and the star-lighting on the main roads can be quickly converted to normal lighting.

St. Helens: Existing star-lighting could be converted without delay.

Wigan: There are 1,800 street gas lamps and the work of preparing them either for "moonlighting" or full lighting has been going on. Whichever system is authorized can be put into operation within a comparatively short period.

Blackburn: Street lamps have been refitted in readiness for a relaxation in the blackout regulations.

Bury: Owing to labour shortage no immediate benefit can be expected.

Sheffield street lighting will not be affected at present. Mr. J. F. Colquhoun, City Lighting Engineer, stated that while the city could change to full peacetime lighting in a matter of a week or two, it is felt that the introduction of any "between" type of lighting would not be worth while.

Neath: Neath Borough gas street lighting system is reported to be in good order. Official circles state that pre-war lighting can be provided at a few days' notice.

Ammanford: Street gas lamps have been well maintained. They will be refixed ready for lighting up by Sept. 17.

Port Talbot: Refixing of lanterns and columns is in progress. Port Talbot will be ready to resume street lighting by Sept. 17.

Cardiff: The maintenance of gas public lamps is the responsibility of the Corporation. Although, it is learnt, a total restoration of street lighting will not be possible by the relaxation date, it is gathered that progress with overhauling, repair, and refixing of gas public lamps is proceeding at a rate which will permit of the restoration of lighting in the principal thoroughfares by the 17th.

Leeds: Mr. C. S. Shapley, Lighting Engineer for Leeds as well as Gas Engineer and General Manager, is unable to make any statement as to what Leeds would be able to do, as up to the end of last week he had received no official intimation regarding what lighting intensity may be permitted. Plans, he said, were all ready to give the maximum lighting permitted in the shortest possible time, and he paid tribute to the preparatory work of the staff at the Bridge Street Depot, who had been working hard on preparations. Alderman A. R. Bretherick, Chairman of the Gas and Lighting Committee, said there would be no difficulty in putting on the fullest permitted lighting in the centre of the city within a few days provided there was sufficient labour to complete inspection of the equipment, replacement, &c. He thought the semi-main as well as main thoroughfares would be ready by Sept. 17 and probably a good proportion of the side street gas lighting also.

Bradford: Bradford Street Lighting Committee and the Gas and Electricity Departments have been busy for some time on such preparations as were possible under the limited labour conditions and the equally limited availability of new lamps to replace damage. The Gas Department is ready with all lamp replacements in its possession, but there is bound to be some time involved before all the street lighting can be given on any new basis.

Huddersfield: Mr. H. Singleton, Engineer and General Manager of the Gas Department told the "JOURNAL" that, apart from the difficulties inevitably arising out of the labour problem and replacement of damaged lamps, if any extension of lighted area was required he expected to be able to meet the improved lighting readily and quickly.

Burnley: The Gas Department will be ready to convert A.R.P. street lights by the removal of masks for 1,400 out of a total 4,000 lamps.

Nottingham was already making preparations for improved street lighting to the maximum allowable and is ready to act quickly in the matter of giving a higher standard of illumination.

Converting the Unbeliever—Some Aspects of Gas Utilization*

By HAROLD S. MILNE, B.Sc.(Eng.),

City Gas Engineer, Aberdeen

THERE can be few areas in this country where the domestic use of gas for cooking and heating is not accepted as quite a normal procedure, but, prior to the war at any rate, the same could not be said of its use for industrial and commercial purposes.

In areas where there is a concentration of similar industries the utilization of gas is often extensive, but there are many towns and cities where the industries are of a diverse nature and where, due to a certain degree of geographical isolation, potential users show little or no interest in the possibility of employing gas as a fuel on account of their having had meagre opportunity of seeing for themselves what is being done elsewhere. Experience gained during the war has shown how production can be improved by the use of modern methods, and it is unlikely now that manufacturers having once glimpsed these potentialities will willingly continue to use wasteful and cumbersome methods if improved equipment is available. The present vital necessity for maximum production with the minimum use of fuel should in future result in fuel costs being viewed much more broadly than formerly. There will be a greater regard paid to the total cost of fuel per unit of output rather than to the cost per unit of potential heat in the fuel and consideration will be given, not only to the amount of this heat which can usefully be utilized, but to the saving of time, labour, and material which would accrue from the use of one fuel in place of another.

The difficulty in relatively isolated areas of obtaining first-hand experience in modern applications of gas is not confined to industrialists but may, in addition, prove to be somewhat of a handicap to those connected with the Gas Undertaking there. For that reason it is thought that some observations on experiences gained in a city remote from the centres of industrial activity may be of interest and perhaps of assistance to those engineers anxious to develop the industrial use of gas in their areas.

Some years ago it became apparent that, with the exception of small appliances, very little gas industrial equipment had been installed in the area since the last war, and an opportunity to remedy this state of affairs was eagerly sought. The Factories Act of 1937 provided a good line of approach, but it became clear that unless gas equipment could actually be demonstrated, progress would be slow. High and low temperature radiant heaters were purchased and installed at the Gas Service Department, and it was decided to design and eventually to build simple types of furnaces. The first furnaces, installed in engineering works, were designed by ourselves and constructed by the purchaser, using the burner equipment and refractories which we supplied. It became obvious, however, that the most satisfactory arrangement would be for us to carry out the complete work, and as the Service Department Fitting Shop was suitably staffed and equipped and under the direction of a skilled engineer, the work was undertaken there. The reorganization entailed in the fitting shop and the experience gained have been of considerable benefit, as not only have we been able to supply special furnaces and equipment at short notice, and to carry out experimental work, but at the present time it has been possible to ease the load on the gas-works engineering staff by carrying out much routine maintenance and reconditioning of works plant and equipment.

Domestic Water Heating

The choice of equipment for water heating can be influenced to an appreciable extent by local conditions, such as water supply and temperature, water undertaking by-laws, and the type of domestic architecture.

In the area under consideration relatively soft river water is available, but the considerable variation between a water temperature of about 33°F. in winter and 60–65°F. in summer creates a difficulty in maintaining a satisfactory adjustment in heaters of the instantaneous type. A further complication which mitigates against the use of equipment of this type is caused by the local Water Department regulations which do not permit of a water heater being connected directly to the water main without the introduction of a ball valve or similar device.

The above two factors were taken into consideration a number of years ago when the whole question of water heating was receiving close attention, and they, together with the fact that there existed a considerable potential field for gas water heating in houses already fitted with hot-water circulation, resulted in the decision being made to concentrate on the sale of circulators.

Several thousand gas circulators have now been installed, chiefly in private houses, but I am glad to say that in the last three municipal housing schemes undertaken gas circulators have been installed as the sole means of water heating.

It is always a difficult matter to arrive at average figures of running cost for domestic water heating, as the conditions before and after the installation of gas equipment are seldom comparable. It is found either that a greater volume of hot water is used, or that the hot water available is at a higher average temperature than was the case when the water was heated by solid fuel.

The following average figures were obtained from the consideration of a number of typical households where in all cases gas is used for cooking and laundry purposes.

WEEKLY COST FOR GAS (PRE-WAR).

Type of House.	Cooker and wash boiler.	Cooker, wash boiler, and circulator.
	s. d.	s. d.
Council houses (four and five rooms) .	2 0	3 4½
Private houses (three and four rooms) .	1 5	2 3

It will be seen that in the case of Council houses the average cost of water heating by gas was 1s. 4½d. per week, with a consumption of 3.76 therms, and in small private houses 10d. per week, with a consumption of 2.26 therms—the installations in all cases being virtually unlagged.

A test has recently been carried out in a five-roomed Council house where the household of ten included eight children, all under 13 years of age. A second return pipe was introduced between the hot-water cylinder and the gas circulator and the cylinder was lagged. This resulted in a marked improvement in the speed of water heating, together with a higher average water temperature, while at the same time the average bill for gas for all purposes, gas cooker, two gas fires, and water circulator, was reduced from 5s. to 3s. 8d. per week.

The housewife was very satisfied with the modified arrangement; sufficient hot water for wash basin and sink was always rapidly obtainable and really hot water was available continuously on wash-day, when using only the top part of the cylinder. It appeared that only when baths were required was it necessary to heat the whole of the storage cylinder.

The local Housing Department were much interested in this experiment, and have indicated that they hope to adopt the alternative return system in future installations.

Central Heating Conversions—Oil to Gas Firing

During the past few years several central heating installations have been converted to gas firing, and the data obtained in two cases where gas was substituted for fuel oil may be of interest.

The heating installation in the first case comprised two oil-fired sectional boilers, rated at 352,500 B.Th.U. and 650,000 B.Th.U. per hour, which supplied the heating for lecture rooms and hot-houses at the Botanical Department of the University.

In 1937 the cost of operating on oil was approximately £450 for fuel and about £120 per annum for repair and maintenance.

One B3 Vesta boiler, with a rating of 750,000 B.Th.U. per hour, was installed to take the place of the larger existing boiler, the smaller boiler being retained for use if necessary during the coldest part of the season. It has been found, however, that during the six years the gas boiler has been in operation its greater flexibility has enabled it to deal adequately with all requirements, while in addition the running cost and maintenance together proved to be only 50% of the cost with oil firing.

The price of the oil used prior to the installation of the gas boiler was 6d. per gallon, and the average cost of gas pre-war 3.5d. per therm.

During the past year two oil-fired sectional boilers in a cinema were converted to gas firing by means of "Duoflam" burner equipment —the boilers being each 904,000 B.Th.U. per hour rating.

Our preliminary estimate for running cost appeared to indicate that the cost of gas would be only slightly less than the actual cost of fuel oil during the previous twelve months, as the boiler attendant had been making every endeavour over that period to obtain the maximum economy in the use of oil.

Over a heating season of 200 days the average figure for oil had been 463 therms per week, while the figures actually obtained with gas firing over the winter three months were 394 therms per week, a saving of 69 therms over the average oil figure for the whole season.

This lower figure for gas consumption represents more than 20% reduction in the running cost as compared with oil, and it is reasonable to suppose that, over the whole heating season, the saving resulting from the use of gas will be appreciably greater.

* Paper to the North British Association of Gas Managers, Sept. 8.

Overhead Heating

During the past five or six years much experience has been gained in the use of overhead radiant heating in different types of premises, varying from heavy engineering shops to churches, and including in the smaller installations offices, shops, and public houses.

Although the advantages of overhead radiant heating are very obvious to those who have had experience of it, potential users accustomed to the long established methods of heating may be inclined at first to regard it with suspicion as being too great a departure from precedent.

It has been found, however, that where an installation has been put to work the user is almost invariably enthusiastic, and, more important, talks enthusiastically of it to his friends. Many enquiries which have led to business have been traced to a chance remark made by someone already using an overhead heating installation.

Due to shortage of materials it has not been possible to take full advantage of the situation so far as this type of heating is concerned, as only the most necessary installations can go forward; nevertheless at the present time the heaters installed in the area have a potential demand for gas at their rated consumption of nearly 20,000 cu.ft. per hour.

The nature of overhead radiant heat is such that comfortable conditions can be attained at a substantially lower air temperature than is the case where a convection system is used, while in addition a feeling of warmth is obtained within a very short time of lighting the heaters and long before the air is heated to any substantial extent. The warmth of the sun on a still frosty day is a familiar example of this effect.

The initial heating effect being to some extent independent of air temperature permits of heaters being placed or controlled in such a way as to heat those parts only of a building where warmth is most necessary, leaving parts where a lower temperature is required to be warmed as the air within the building gradually rises in temperature.

Almost any type of building can be satisfactorily heated by overhead radiant heat provided that the ventilation is adequate and that the roof is high enough to permit of the heaters being mounted at a sufficient height from the floor, without at the same time being in too close proximity to inflammable materials in the roof.

Churches and other lofty buildings used intermittently have always been recognized as difficult heating jobs, due to the fact that the heating is seldom in operation for a sufficiently long period before the building is occupied to allow of the whole of the air being brought to a reasonable temperature. What usually happens is that the heating is only put on long enough beforehand to induce rising hot air currents, with the result that when the building is in use there is a constant downflow of cold air from the roof. The provision of overhead radiant heating in a building of this type results in the heat being directed towards the occupants, and permits of comfortable heating conditions being attained quickly and for a minimum expenditure on fuel.

The modern industrial building with its relatively light construction and large expanse of roof presents a difficult heating proposition if fuel costs are to be kept within reasonable limits, and particularly is this so when large doors have to be opened frequently or where a relatively small number of workers are grouped about a large area of floor space. It is in conditions such as these that the very definite advantages of radiant heating show up most strongly, particularly on account of the low air temperature which is necessary for comfort and the facility with which the heating effect can be concentrated where most required.

It might appear at first sight that, due to the screening effect of work benches, radiant heat from an overhead source might not be very satisfactory in cases where work of a sedentary nature is being performed, but it should be remembered that most complaints of cold legs and feet result from currents of cold air at floor level induced by the movement of warm air and difficult to overcome by convected heat. In the case of radiant heat, however, a substantial proportion of the rays fall on the floor which is thereby warmed and becomes in effect a large low-temperature radiator transmitting warmth to the air passing over it.

There are two main types of overhead heater in general use, one having a heat input in the region of 12,500 B.Th.U. per hour, and the other an input of about 50,000 B.Th.U. per hour.

It will probably be found that where large areas have to be heated, and where the height of the building will permit, the more powerful type of heater will show a saving in capital cost, but in those cases where the ceiling is low or where the heaters can only be placed in positions close to workers, it is often more satisfactory to use a larger number of the lower powered heaters.

The capital cost of an overhead heating installation in a factory or workshop compares very favourably with that of alternative methods of heating, and in recent installations which we have carried out has been between £40 and £45 per 1,000 sq.ft. of floor area when using the larger type of heater.

Gas consumption is surprisingly low and, with a thermostatically controlled installation, averages over a heating season about 0.55 therms per 1,000 sq.ft. of floor area per working hour.

Core Drying

The use of gas for the drying of small moulds and cores is fairly general, but its use in connexion with the drying of large moulds for heavy castings is not so common as it might be. Perhaps one of the reasons for this is that those connected with moulding shops appear to work largely by rule of thumb, and are seldom able to state with any degree of exactitude the conditions requisite for satisfactory drying. It is probable, too, that the question of fuel cost may be considered by itself without any attempt being made to set against it savings in other directions which may be effected by the use of gas-fired drying ovens.

It is usual for the sand cores and moulds to be placed in a brick oven and the drying performed by blowing into the oven a stream of air which has been passed over and through a fire of furnace coke. Obviously, with an arrangement such as this the temperature of the dry air will vary according to the state of the fire, and it is not unusual for temperatures within the oven to vary over 400°F. in less than an hour, reaching perhaps as high as 650°F. These high and fluctuating temperatures result in cracked and burned moulds, necessitating careful patching by the moulder before they are fit to be used. The length of time required for drying will be governed to an appreciable extent by the attention given to the fire during the drying period, and as drying is usually carried out overnight the minding of the fire is just another duty to be performed by the watchman. Under these conditions it is not surprising that casting may be delayed due to a mould or core having become damaged or requiring to be returned to the oven for further drying.

The desirability of taking the guesswork out of core drying was appreciated by the management of a foundry engaged on fairly heavy work, and resulted in the installation of a thermostatically controlled gas-fired drying oven which has proved in every way most satisfactory in operation.

In preparing an estimate of gas requirements and running cost it was necessary to make certain assumptions, as the only definite facts known were the size and weight of the largest moulds to be dried and the time available for drying.

Calculations were based on an oven having internal measurements of 10 ft. by 10 ft. by 9 ft. high, built of 13½ in. brickwork, the inside face being of 4½ in. high quality insulating brick. Allowance was made for recirculating the heated air which it was assumed would require to be at a temperature of 450°F., the saturated air being vented at a rate of ten air changes per hour over a drying period of 24 hours.

The maximum load to be charged was found to be made up of 9,000 lb. of iron forming the boxes and bogie and 20,000 lb. of sand with a 10% water content, and it was estimated that the drying of this would require the expenditure of about 83 therms of gas or 4.15 therms per 1,000 lb. wet sand.

The first test after the oven had been completed was made with a load of 16,350 lb. of wet sand which was dried at a temperature of 400°F. for a period of 16 hours, the number of air changes being 13 per hour. On examination it was found that although the surface of the mould was well dried the centre was still too damp to permit of a cast being made; while in addition the quantity of gas used was too high, being approximately 7.7 therms per 1,000 lb. of sand.

As it was thought that the disappointing result of this test was due to the early formation of a dry crust on the mould interfering with the penetration of the heat and with the liberation of moisture from the centre of the mass, it was decided to find out the effect of a higher degree of humidity and a further test was made using a temperature of 350°F. and seven air changes per hour.

The result of this test was highly satisfactory, the mould being perfectly dried in 16 hours for a gas consumption of 4.25 therms per 1,000 lb. of sand. With further experience it has been found possible to effect an economy by shutting off the gas some two to three hours before the completion of the drying period, and by continuing to recirculate the air to recover some of the heat stored in the brickwork of the oven.

The introduction of this oven resulted in a reduction in drying time of almost 75%, while the necessity for cleaning and patching moulds after drying was reduced to a minimum.

Gas in the Blacksmith's Shop

Few people would now consider using an open fire for heat treatment work if a suitable furnace were available, yet it is surprising to find that the use of furnaces by engineers and blacksmiths for more commonplace heating processes is neglected in favour of the old-fashioned forge.

With the now very general use of flame or arc welding there would appear to be no reason why the blacksmiths' hearth should persist, as there are few operations performed by a blacksmith which cannot be done better and more rapidly in a simple and robust gas furnace.

Following an enquiry from a large engineering firm who were in process of reconstructing and extending their blacksmiths' shop, the writer endeavoured to obtain particulars as to the use of small gas forging furnaces for general blacksmiths' work. Unfortunately there appeared to be little information on the subject, so it was decided to build experimental furnaces and to carry out practical tests in the blacksmiths' shop at the Gas-Works.

The tests gave very satisfactory results and showed that forging heats could be obtained readily and much more rapidly in the furnace than in the forge, while the risk of damage by burning was largely eliminated. In cases where a uniform heat was required the fire proved to be a very bad second, while the ease and speed with which repetition work was carried out and the good condition of the finished articles were very favourably commented upon by the smiths.

The results of these experiments convinced our engineering friends of the suitability of gas for their work, and instead of increasing the number of forges when extending their shop they dispensed with more than half of their original number and substituted a lesser number of small gas furnaces in their place.

The change-over has proved, after some two years, to be well worth while and very acceptable both to the management and to the workmen—the management on account of higher output, lower costs and fewer rejects—and the men on account of cleaner and roomier surroundings, the improved finish of their work and the ease with which it can be performed.

When it is remembered that a large proportion of a blacksmith's time is spent on mending his fire and in moving his job to try to obtain even heating or to prevent burning, and that it is necessary for him to bring every article separately to the requisite working temperature, it will be realized how very great indeed will be the saving when the smith has merely to place his work in the furnace and go on with something else while it is heating. There is no risk of burning and little scale is formed, the heating is uniform all over and just right. There is no need to keep turning or moving the job, and if a batch of articles are being heated each will be at the same temperature when required, and work once started can proceed with a swing, uninterrupted by the pause usually required to give each piece the final heat in the fire.

Small forging furnaces, and others of special type, have now been installed in several blacksmiths' shops, and without exception the users are enthusiastic as to the results obtained, it being generally agreed that the work done is superior to that done in the fire, while the saving in time is appreciable, being as high as 75% with work of a repetition nature.

There cannot be many areas where gas is available which do not contain at least one blacksmiths' shop where there exists a potential demand for gas for forging purposes. This use for gas appears to have been neglected up till now, but there seems to be no reason why progress should not be made. The field is wide enough.

Pipe Bending

Some time ago a request was received from a firm of shipbuilders for an augmented supply of gas to their plumbers' shop, and on enquiry it was learned that they hoped to instal gas burners in one of the coke hearths used for pipe bending. The heating of the sand-filled pipes was a slow and laborious business, and to avoid a bottle-neck it was essential to provide a speedier method of heating.

It so happened that we had just built for our own use a portable gas furnace for bending pipes up to 4 in. diameter and this was lent to the shipyard in order that gas heating could be compared with the existing method. The first day's trial provided everyone with a surprise as a normal day's work was completed early in the forenoon.

Furnaces have now been installed to deal with pipes up to 8 in. diameter and very satisfactory results are being obtained, both as regards output and accuracy of finish.

The foreman plumber estimated that the use of gas furnaces had resulted in a fourfold increase in output, and gave as an example the work performed by a single squad of five men over a period of ten hours, including a meal break. This consisted of sand filling two 6 in., two 5 in., and three 3 in. pipes, and making on each a 90° bend and a 45° set.

The Industrial Gas Centres have done much to develop the use of gas in industry, but if sufficient progress is to be made it is essential that, in addition, all gas undertakings should do everything possible to develop the use of gas by industries in their area. It is only by frequent personal contact with those in local industry that full benefit may be derived from the more enlightened attitude to production now in evidence—personal contact coupled with service which should in time result in the gas undertaking being consulted as a matter of course on problems of fuel utilization.

The Glasgow Gas Department has a most attractive exhibit at the "Glasgow Advancing" exhibition opened in the Kelvingrove Art Gallery on Aug. 22 offering indications of wartime activities and post-war planning.

The Factory Department of the Home Office has just issued a revised version of Factory Form 814—"Memorandum on Explosion and Gassing Risks in the Cleaning, Examination, and Repair of Stills, Tanks, &c." (H.M. Stationery Office, price 4d. post free). The revision of this Memorandum was in progress in co-operation with the Works Technical Committee of the Association of British Chemical Manufacturers, when war broke out and the work had to be suspended. It has recently been possible to resume and complete the revision and the present edition is the result. In connexion with this work, the Works Technical Committee prepared a summary of the precautions recommended in a convenient collected form and of a size suitable for attachment to the Memorandum. The summary is a domestic effort on the part of the Association, although the Factory Department is broadly in agreement with it, and is circulating copies to all Factory Inspectors for them to bring it to the notice of other industries. The summary is based on the new Factory Form 814, but it has no other official significance.

Coke Grading

The following written communications have been made to the discussion on the Paper on "Coke Grading" which Mr. T. A. Tomlinson gave to The Institution of Gas Engineers (see "JOURNAL," of June 7 and 14). We also publish the Author's reply.

Mr. R. J. Restall (Stalybridge): It is thought that the definition quoted by the Author for screening efficiency is the one generally accepted and means that the greater the number of coke pieces smaller than the specified size, the lower the screening efficiency. In the case of dry cooled intermittent coke, over a number of years tests have been taken of screen efficiency and good results have been obtained by using square hole plates to remove breeze and No. 4 coke, and round-hole plates for the other sizes.

The plant at Stalybridge is a Broadbent counter-balanced screen, inclined at 5° working by belt drive from a 5 B.H.P. motor giving the chassis 170 motions per minute, and all bearings, except the main shaft, are of the silentbloc rubber type. The cutting, conveying, and screening operation use under 2 units per ton. The production of breeze over the six years 1939–44 works out at 9.5%, and as the coke is dry the breeze is easily removed and does not adhere to the coke surfaces.

The average screening efficiency is as follows:

No. 4	91.5%
No. 3	91.2%
No. 2	94.3%
No. 1	92.3%

The operation is carried out in the order stated.

On this screen "blinding" takes place as shown from average tests as follows:

No. 4 Square holes	5.5%
No. 3 Round holes	7.0%
No. 2 Round holes	26.0%

The "blinding" on No. 2 screen occurs on the first of a series of flat round hole screen plates, and is due to the shape of the intermittent vertical coke. While sizes Nos. 3 and 4 tend to be polyhedric, No. 2 contains approximately 50% of finger coke. This also applies to No. 1, which is the last size to be thrown out and passes, of course, over a plain plate.

Coke is one of the most difficult materials to handle, and the Author advocates robust construction and simplicity in design of plant, with which I agree. It is suggested that in handling and screening operations carrying of the coke should predominate. It has also previously been suggested that the simple straightforward type of plant is preferable to the complicated one. It would be interesting to know the maintenance costs of plants similar to that shown in fig. 4.

Provided plants can be obtained, the lower the cost of installation the better will be the prospect of following out the recommendations of the Institution's Committee of Enquiry on Coke Quality.

A soft type of coke admittedly requires gentle handling, and with this in view falling distances should be short and the screen of slow-moving type, which avoids jumping. The final de-breezing, if required, would also be done better by a slow-motion screen, thus preserving to some degree the sharp edges stated as being desirable for easy ignition. Such coke is, however, really unsuitable for general use. Coke so friable as to require this gentle treatment may be suitable for domestic purposes, but a coke having a strong and dense structure will stand rougher treatment, stocks better, and screens better, as the Author suggests.

This point is made to show that the producer should be prepared to cut and grade coke to suit the market; an increase in demand for a particular grade may affect the quantity of breeze being made, and if the coke is hard enough it will stand this operation with little financial loss to the producer. It is therefore suggested that coke should be denuded of all possibility of forming breeze after being loaded, as previously advocated in the Discussion on W. L. Boon's Paper entitled "The Preparation, Marketing and Utilization of Coke" (Communication No. 114) before the Institution in 1935.

Over the six years the charges at Stalybridge work out as follows:

Handling charges 2s. 11d. per ton handled.
Maintenance of plant 7d. per ton handled.
Total charges 6s. 10d. per ton handled.

Of the total coke and breeze sold during the year ended March 31, 1944, only 56 tons were large coke—*i.e.*, unscreened.

Mr. T. R. Cook (Blackpool): If in the Gas Industry from 25% to 30% of the total revenue is derived from the sale of coke, it would appear to be of paramount importance to produce coke of the correct size for the appliances in which it is used, if sales are to be maintained and the highest revenue obtained. Unfortunately in the Industry there is still a considerable amount of coke on the market which receives no screening whatsoever, and many gas undertakings still adhere to the old methods in the sale of coke as drawn from the retorts, plus as much water as the coke will carry. Gas engineers know that there is nothing new in this statement, but surely this fact must have a very prejudicial effect on the coke market as a whole and will work adversely against the Gas Industry in providing a suitable fuel to displace coal.

It is true to say that many undertakings in the category mentioned will probably receive a higher revenue per ton of coal for the product than undertakings endeavouring to produce a free burning clean fuel, but this position will only last while the demand exceeds the supply due to fuel shortage, and pre-war conditions will probably prevail when the position becomes normal.

It seems certain that in the post-war era much more carefully considered grading and storage plants will have to be installed in order to stem the competition which the Industry is likely to receive, and Mr. Tomlinson's Paper is indeed very timely.

The design of the modern coke grading and storage plant described in my Paper to the Institution in 1940 embodies many of the principles outlined by Mr. Tomlinson for the production of dust-free well-screened and graded coke. During the past four years we have delivered to the consumer a breeze- and dust-free coke, correctly graded and with practically no variation, but the disposal of the fines and dust has been a most difficult problem which has only recently been overcome by wartime conditions and the shortage of fuel. In the production of a dry coke from vertical retorts, the dust trouble in the retort house is most objectionable, and I would welcome a satisfactory and efficient plant to remove the dust, which is an irritant and, to say the least, will have a prejudicial effect on the health of the retort house personnel. I believe in providing the consumer with a dust-free coke, but have reached an *impasse* as to the correct disposal of the dust when it has been collected. One method which has been adopted by some undertakings is to sell all coke from ¾ in. to fines as a boiler fuel, but it is not an easy matter to dispose of so fine a dust when intimately mixed with the breeze, since dust is generally worthless as a fuel and becomes "air borne" in the slightest movement of air.

I do not favour adding moisture to the coke at the extractors, because of the cost of maintenance to lip bucket conveyors and screening plant ; moveover, the dust adheres to the coke and separates out on the consumer's premises.

With regard to screens, I strongly favour the vibrating type, which in my experience has been the most effective and the least costly to maintain in the screening of dry vertical retort coke.

The following information, collated from the new grading plant at the Marton Works, Blackpool, is of interest, and if the results are maintained, this expensive installation will have more than justified the project upon which we embarked.

Coal used: 80% Yorkshire, 10% Lancashire, 10% Durham.
119,500 tons of coke handled through screening and grading plant.
Coke screened into hoppers, debreezed at coke hopper outlet chutes.
Average moisture content = 1.25%.

Over 1½	63.35%	Average price	52/9 per ton.
1½ to ¾	19.60%	,, ,,	52/9 ,,
¾ to ⅜	4.55%	,, ,,	30/- to 35/- per ton.
⅜ to dust	12.50%	,, ,,	4/6 to 7/- per ton (when disposable).

Total cost of conveying, screening and dedusting coke from June, 1940, to December, 1943, works out at approximately 2s. per ton.

The coke hopper of 1,000 tons capacity has reduced the labour in handling to a minimum and the provision of numerous outlet chutes from the hopper, together with weighing apparatus enabled the merchants' carters to load their vehicles themselves and weigh the coke into bags, obtaining a quick turn-round of traffic. A maximum of three men per day employed by the Gas Department has been found adequate to deal with sales. Although the plant has not as yet been worked to its rated capacity, the capital cost of the plant (interest plus sinking fund 10%) plus maintenance and labour has amounted to approximately 2s. per ton of coke sold, which under wartime conditions is not excessive, having regard to the careful grading and handling the coke receives and the general results obtained.

The cost of handling coke and breeze into and out of ground stocks is a much greater problem than the grading and storing in hoppers, and the limit of overhead storage accommodation is always very debatable, but in extensions or the building of new carbonizing plant this question is worthy of the greatest consideration and is largely ruled by the weekly output and demand for coke over the year, and the quantity of coke which must be stocked to supply the trade during periods of heavy peak load demands over protracted periods.

Mr. **A. G. Sims** (Robert Cort & Son, Ltd.) : Every engineer responsible for the production and distribution of coke fuel should be fully aware of the essentials of good screening plant (as set out in text-book form by the Author) and I do not hesitate to affirm that results bordering on perfection in regard to effective screening at low initial and maintenance costs are possible with plant now available, providing the design of the assembly as a whole bears the hallmark of experience. The theoretical considerations put forward are interesting, but the selection of the best means for size grading of the coke is controversial. I suggest that the best type of screening medium is more readily, and certainly, determined by trial, using test screening panels of the various types (perforated plate, welded and woven wire, &c.) available. It is the practice of the firm with which I am connected to carry out tests of this character before making the necessary decision, for, in their opinion, one type of medium is not universally the ideal for all makes of coke, nor screening equipment.

The Author's discussion of the type of screen to be selected appears to miss the point relative to the fact that the reciprocating and/or oscillating type of reputable make will definitely fulfil all the criteria he has laid down which can be substantiated by actual practice.

The layout in fig. 4 appears to be susceptible of no little criticism. It is agreed that breakage of coke during handling must be the minimum. Contribution to this desirability would be adversely affected by the series of transfers at the points where screens, conveyors, and chutes are introduced; the numerous separate units involved, all having potential wearing parts, would result in comparatively high power consumption and maintenance cost. The type of plant proposed necessitates an abnormally high structure—25–30 ft. higher than required for an efficiently designed plant incorporating reciprocating screening-conveyors and, in consequence, at a relatively much higher capital cost. Very considerable expense would also be incurred in providing the necessary numerous access stairways, platforms, &c., around the various units indicated, whereas the natural covering, with slight additional reinforcement, at the top of the bunkers and one platform is all that would be required with the alternative plant.

The distribution of the coke in the hoppers, if effected in accordance with the layout as drawn, would be extremely poor, and the excessive height of the hopper outlets required to accommodate the debreezing, bagging, or loading facilities would undoubtedly make for increased breakage, breeze formation, and excessive abrasion.

My wide experience of coke handling and screening plant suggests, with all respect, that some of the recommendations and the layout design shown in the Paper are not in accordance with the best practice and could be improved upon considerably.

Mr. **Tomlinson** replied: The figures given by Mr. Cook and Mr. Restall are valuable contributions to the discussion of this subject. Mr. Restall's questions are answered by Mr. Cook, since the Blackpool plant is designed practically on the lines of the schematic layout of fig. 4. Mr. Cook's figure for maintenance is 1.77d. per ton against Mr. Restall's 7d., but, of course, it must be borne in mind that the plant at Stalybridge is considerably older than that at Blackpool. Mr. Restall's total cost contains items not included in Mr. Cook's.

Mr. Cook's contribution also provides the answer to Mr. Sims' criticisms. The high structure of fig. 4 is safe with the vibrating screen, but the whole structure, even though considerably lower, would need to be very much more substantial if it had to take up the vibrations set up by the heavy oscillating masses of the screening-conveyor. Fig. 4 is diagrammatic and the superstructure is not so high, proportionately, in practice. At the same time there are cases, particularly with plant of small capacity, when the convenience of the screening-conveyor outweigh its technical disadvantages. The distribution of the coke in the several compartments of the bunkers, as well as the provision for bagging and weighing, has been found quite convenient in several installations on these lines. Debreezing, weighing, bagging, and loading facilities are necessary to the modern installation and it is false economy to cramp these operations in any way. Plenty of room enables vehicles to be loaded and got away without delay.

Diary

Sept. 18.—London and Counties Coke Association : Finance Committee 11 a.m., Executive Committee 11.30 a.m., Central Committee 1.30 p.m., Gas Industry House.
Sept. 27.—Industrial Gas Centres Committee, Birmingham Gas Department, Council House, Birmingham, 11.30 a.m.
Sept. 28.—Wales and Monmouthshire Association of Gas Engineers and Managers: General Meeting, Institute of Engineers, Park Place, Cardiff, 11 a.m.
Oct. 11.—Southern Association of Gas Engineers and Managers: General Committee, 11.30 a.m.; Autumn Meeting, 2.30 p.m.; Grosvenor House, Park Lane, London.
Oct. 12.—B.G.F. Domestic Heat Services Committee, Gas Industry House, 2.30 p.m.
Oct. 27.—Manchester District Association of Gas Engineers: Autumn General Meeting.

Mr. F. W. Wort, of the Liverpool Office of John Wright & Co., Ltd. (Radiation Ltd.), has been appointed to referee the International Football Match between England and Wales on Sept. 16.

Dividends

Coatbridge.—Final of 9½% on the original stock, making 14½% for the year; on shares 12s. 11¾d., making 19s. 11⅝d. for the year (same).
Pitlochry.—5% on past year's working.
Severn Valley.—Interim on Ordinary Stock of 2¾% actual, less tax, on account of year ending March 31, 1945 (same).

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

Some Aspects of Administration in a Small Works*

By W. A. CURRIE,

Engineer and Manager, Renfrew Corporation Gas Department

Introduction

WHATEVER the future holds for the Industry, managerial policy will be based on accurate appreciation of technical and financial data as far as is possible. Personal relationships and skill in judging imponderables must continue, but to an increasing extent indices of technical efficiency and financial cost, as well as of less familiar factors, will become more and more used. Allied to this is the expectation that the works are likely to be the least of the gas manager's preoccupations; reorganization problems, particularly the overhaul of district practice and consumer service with inadequate resources, are more likely to provide headaches than the works, where we have a fairly adequate supply of competent personnel whose operations may be supervised through reports—technical and financial—while personal attention goes to distribution and service.

The principle adopted is that technical and financial factors are dynamic, and day-to-day variations must be taken into account to obtain optimum efficiency. This leads to the adoption of the shortest practicable periods for their measurement, and the appraisal of those factors which cause significant errors. The periods adopted are the week for technical data and the month for financial data.

An effort has been made in the brief time available to describe the methods used in a small works to appreciate the significance of the technical data collected, and to describe the methods by which financial data is collected and analyzed.

Summary

Part I is a description of the methods adopted to determine as far as possible the actual technical results being turned out by the plant. The difficulties of determining quantity and quality of the coal used with adequate accuracy are briefly mentioned.

The usual weekly figures are worked out for gas made, therms per ton, therms per retort, coal per retort, and the plant efficiencies according to our standards, which are not to be considered absolute. The results of the last four weeks are added together and a fresh set of indices prepared. These iron out the irregularities, the significant as well as the insignificant, and are used to assess the actual consumption of coal and so obtain the final group of indices called the "adjusted" group. Results referring to rather variable periods are shown in fig. 1.

Part II describes briefly the cost and financial control system. Fig. 2 shows diagrammatically the scheme of allocation and collection of the elements of cost, fig. 3 the cost account analysis, and fig. 4 the cost of gas manufacture sheet as at present in use. In order that the significance of variations in the figures should be brought out two cost comparison sheets are in use, fig. 5 and fig. 6, the first showing general data and the second cost account data.

Part III indicates the factors involved in the cost of gas which may be operated on to reduce the cost to a minimum, or to determine what mixture of gases should be made to produce a required amount of gas per day with a given supply of coal and oil. Fig. 7 shows the delivery outputs from vertical retort and Tully plant during a week in spring, and indicates the extreme flexibility of the method and the conservation of gas stock reserves which results.

Fig. 8 illustrates the tactics of gas production when certain variables are assumed to be fixed—*e.g.*, when coal is assumed to be £2 per ton and the total gas demand is 2,000 and 3,000 therms per day.

* Paper to the North British Association of Gas Managers, Sept. 8.

Part I.—Evaluation of Gas-making Results.

1. *General.*

The critical examination of gas-making results is a most valuable tool in the management of plant. To be most useful the results should be current; a continuous recorder showing the overall efficiency factor of the gas-making plant represents the objective to be attained.

The efficiency factor depends on the coal carbonized, its weight and quality, and the total therms made, and of these only the gas volume and calorific value may be determined with reasonable accuracy over short periods. In assessing the value of the coal being carbonized it is not difficult to determine by experience what output of gas, &c., is obtainable from a given coal, but it is impossible to say exactly what blend of coals is going through at any time owing to the general practice of maintaining two days' stock above the retorts, and to the uncontrolled mixing and separation of sizes which goes on as the coal is being filled into and moves down the hopper.

Another complicating factor is that the quality and yield of gas to-day comes from coal which was elevated to the hoppers yesterday, while if we wish to determine what weight of coal was carbonized we must take the weight of coal put up to-morrow, this being equal to the weight of coal used to-day if we take into account the various factors which interfere with the accuracy of the method—for instance the coal level in the hopper and the bulk density of the coal. An error up to 5 tons, which is significant in most works, may also be involved due to the whole of a wagon being treated as one unit when elevating—that is, though 5 tons only may be required to bring the hoppers to level the whole wagon goes up and is charged into the coal consumption.

To obtain results which are as nearly current as circumstances allow we have to work out the results on a weekly basis, and consider them as subject to the aforementioned practical limitations.

2. *Application to Continuous Vertical Retorts.*

Charts A to I with V and W represent data from the retort setting at Renfrew Works during one of our more adventurous periods.

The first set, A, D, and G, indicate the plant efficiency, the coal per retort per day, and the therms per ton as calculated from the weekly data. The "Plant Efficiency" is the ratio between the therms per ton found and the therms per ton expected on the basis of previous experience of the coals carbonized during the week. It is therefore

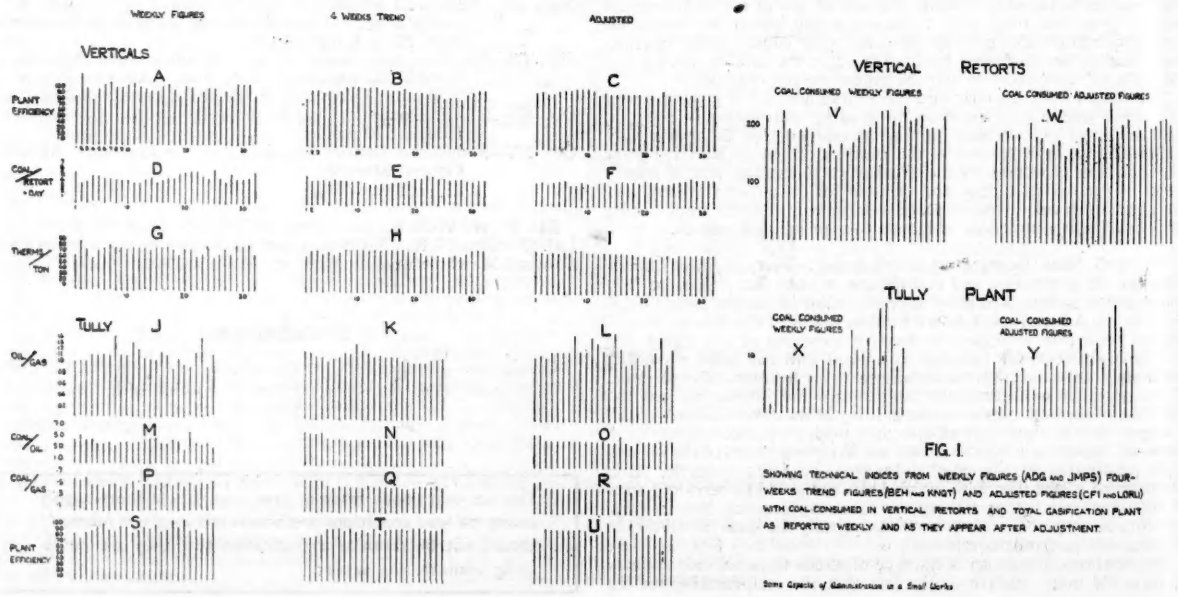

FIG. 1.

SHOWING TECHNICAL INDICES FROM WEEKLY FIGURES (ADG AND JMPS) FOUR-WEEKS TREND FIGURES (BEH AND KNGT) AND ADJUSTED FIGURES (CFI AND LORL) WITH COAL CONSUMED IN VERTICAL RETORTS AND TOTAL GASIFICATION PLANT AS REPORTED WEEKLY AND AS THEY APPEAR AFTER ADJUSTMENT.

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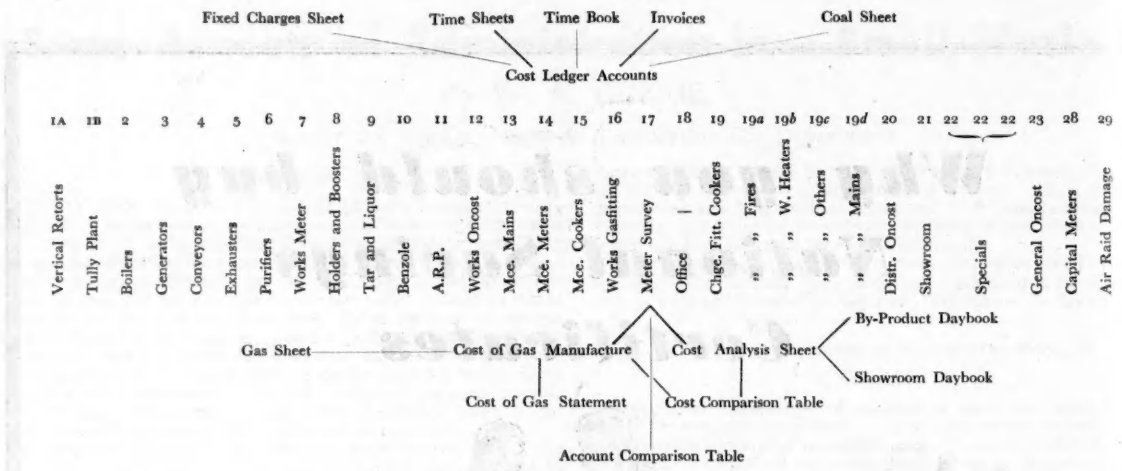


FIG. 2.—*Diagram Showing Cost Account System.*

not an index of the absolute efficiency of the plant, but is an index of the relation of present to past working.

The effect of errors in the measurement of the coal is patent in the wide variation in the results, especially in those cases where the plant efficiency is very high, due to incomplete filling of the hoppers, or to the filling of the hoppers early in the shift (which may involve an error up to 13 tons) on the last day of the week.

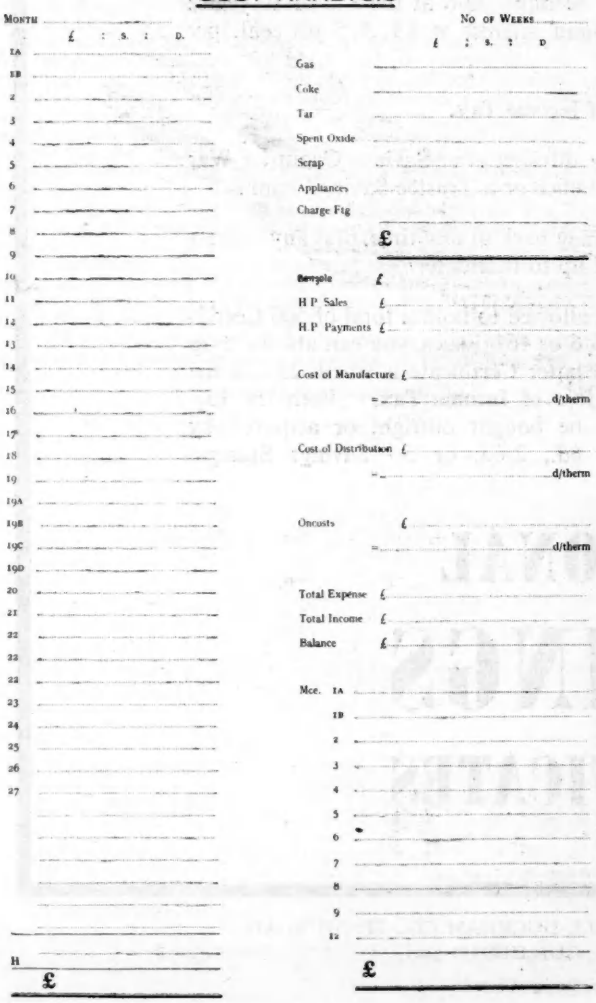
The second set of charts, B, E, and H, are obtained by adding the first four weeks' coal, gas, retort days, &c., and working out the ratios anew. These are in effect monthly data divided by four, and they show, not the current week's results, but a relative figure which gives the trend of events. The wider variations are ironed out partly by making up shortages in adjacent weeks, and partly by the dividing of the various errors by four.

The third set of charts has been derived from the first with the trends shown in the second in view. In this series, C, F, and I, a high therms per ton with a low coal per retort and a high efficiency has been adjusted to give what appears to be a reasonable figure. This process, though it appears to produce the results the adjuster requires, automatically corrects itself, since the total coal and total therms must be constant, and any unusually good results automatically produce correspondingly bad results elsewhere.

In practice charts A, D, and C are prepared weekly with B, E, and H derived from them, but the final series C, F, and I are worked out at six- or eight-week intervals in order to get a general view of some six weeks taken together.

The value of the results is only to be obtained when they are correlated with the existing conditions on the plant, and the various indications investigated and corrected. Chart A shows how useless weekly figures can be if accepted in an uncritical spirit, while chart B shows how expressionless monthly figures are. The falling away in plant efficiency was, on investigation, found to be one of the results of improved coal deliveries, resulting in better bunker levels being maintained along with a progressively earlier filling of the hoppers on the last day of the week.

FIG. 3.
COST ANALYSIS



3. *Application to Carburetted Total Gasification Plant.*

When first applied to this plant the method gave many more discrepancies than when applied to the vertical retorts, owing to the small amount of coal handled, the variation in make per hour as the clinkering time approached, the practice of storing the gas before metering, etc. The skip hoist used to fill the bunker has a capacity which is an appreciable fraction of the bunker capacity, so that a skipful more or less involves an error up to 7½ cwt., which is about 5%.

These errors were eliminated as their sources were disclosed by study of the charts, and now the chart of data as found may be taken as the adjusted; the gas in stock is taken into account, the oil gasified is checked each hour by the plant operator and adjusted if necessary to the current make. The skip hoist is no longer used for assessing coal gasified, this duty having been transferred to the mechanical shovel bucket, which has a smaller capacity and so a smaller error. By eliminating observational errors it has been possible to fix the best carburetting temperatures, and to adjust the cycle with some confidence in getting the results required.

The coal/oil ratio is calculated in tons of oil gasified divided by tons of coal gasified, this ratio fixing the standard therms per ton of oil and coal gasified. The oil/gas and coal/gas ratios are derived from the weight of the material gasified in tons divided by the gas made in therms and multiplied by 100 to obtain the figures shown.

Charts J, M, P, and S show a representative group of weekly results as found, Q, N, and T the monthly trend charts as previously described, and L, O, R, and U the adjusted results.

(*To be continued*)

Gas Consolidation, Ltd.

The Tenth Annual General Meeting of Gas Consolidation, Ltd., was held on Sept. 5 at 15, Moorgate, London, E.C. Major Julian Day, M.C., the Chairman, presided.

The CHAIRMAN said: Gentlemen, the accounts for the year to May 31, 1944, present in abbreviated form the financial results of another year's operations in the abnormal conditions pertaining to this period of world-wide war. They contain, however, nothing to suggest anything but steady progress in normal conditions. From a purely financial point of view they display merely a satisfactory state of stability.

In the balance-sheet the increase of investments in shares of subsidiary companies is due to the acquisition of additional holdings in companies previously within the group, for no enlargement of the group is permitted under present restrictions.

The revenue account shows a slightly higher net revenue which after allowing for dividends at unchanged rates is reflected in an increase of nearly £3,000 to £14,849 in the credit carried forward to next year in profit and loss account. The dividends to be confirmed at this meeting are the final dividend of 2½% on the "A" Ordinary shares, and the final dividend of 3% on the "B" Ordinary shares, making 5% for the year on both issues subject to income-tax. These are at the same rates paid since 1940.

I am still restrained from giving details as to the operations of the subsidiary companies, but I may say that in the aggregate the large increase in supplies of gas which the operating companies have been required to meet, and to which I referred in some detail last year, have been more than fully maintained. The difficulties in meeting requirements have not only continued but have become more acute; and of all the difficulties the hardest to overcome has been the shortage of experienced labour. That satisfactory service has been maintained throughout the area with so little interruption is due to the untiring efforts of operating staff and employees, and to the team work between adjacent companies as well as to the aid rendered by the parent Company's operational staff. On the whole I can report that the very exceptional difficulties of a critical year have been successfully surmounted.

As I have emphasized on other occasions, one of the main objects of this Company from the date of its formation some ten years ago has been to play its part in bringing about regional integration in the Gas Industry. Although this has now become widely recognized as desirable in the national interest, progress to that end has been prevented during the whole period of the war by restrictions imposed by the authorities to which the control of the Gas Industry has been assigned. Such restrictions have held up amalgamations in any form, whether their intention was to strengthen integration within an established group or to bring into such a group additional undertakings. Some physical linking together of undertakings by connecting mains has been sanctioned, but other such proposals have been vetoed on the ground that they were not immediately essential to the war effort.

It may be opportune to mention the progress which has been made, chiefly in the five years vouchsafed to us before the outbreak of war. This Company has acquired by purchase four publicly-owned gas undertakings, all of which have been interlinked with their neighbours by connecting mains and have been brought under combined management in each case; six other undertakings had been partly interlinked when further progress was necessarily suspended; a complete scheme which awaits sanction has been drawn up for the grouping into one unit of ten undertakings, three of which belong to the Severn Valley Gas Corporation group; considerable progress has been made in giving effect to group management as distinct from separate management for each isolated unit. Although but a modest beginning, these are all definite and practical steps towards regional integration.

The developments of the last few years make it apparent that in the future the utmost value must be obtained from every ton of coal produced in the United Kingdom. Wasteful consumption of this fundamental raw material must be reduced to a minimum. This in itself assures to the Gas Industry an ever-increasing importance in the national economy, for it is only through carbonization that the maximum value of coal is obtainable. It follows that the Industry must use every means to exploit to the fullest degree all by-products of gas production. If it can be supplied at economical rates the demand for gas for industrial purposes is capable of enormous increase; many new uses have been developed during the war period, not only for gas, but for its by-products, and additional by-products have been extracted.

When some of the present restrictions on operation can be removed, important developments may be reasonably anticipated which should tend to lower the price of gas in comparison with other fuels, and to extend its sphere of use. These may be aided by schemes for regional integration which are now being considered, but they will also require a courageous spirit of enterprise which must not be allowed to be suppressed or unduly hampered by unnecessary Governmental control.

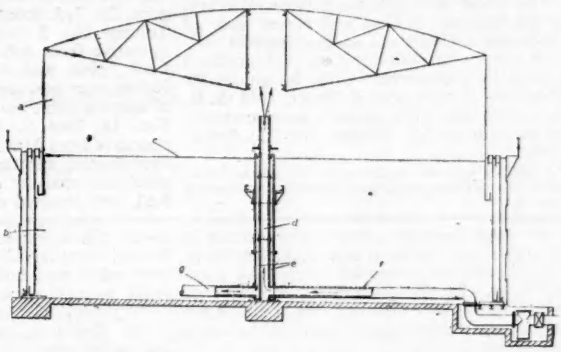
In conclusion I must again express the thanks which are due to the officials, staffs, and all employees of the central organization and constituent companies, whose efforts and loyal co-operation have our full appreciation.

The report and accounts were unanimously adopted and the proposed dividends were approved.

Spiral Gasholders

Among new patents is one (No. 562,220) taken out by the Gas Light and Coke Company and F. M. Birks relating to spirally-guided gasholders. It is applicable especially to holders of a relatively small size in which there is a relatively great liability for the water in the gasholder tank to freeze. The object is to provide a form of holder in which the risk of damage to the parts, particularly the inlet and outlet pipes, due to the formation of ice at the surface of the water in the tank, is reduced to a minimum.

Gas is let into and away from the tank of a spirally-guided gasholder through vertical pipes which are coaxial with one another and the gasholder tank. It is preferable for the gas inlet pipe to be arranged centrally within the annular gas outlet pipe, and to project slightly above the gas outlet pipe so as to ensure proper mixing of gas in



the holder. With such a coaxial arrangement, if the water in the tank freezes at the surface and adheres to the gasholder bell around the edge and to the inlet and outlet pipes near the centre, there is practically no risk of damage to the two pipes since, when the gasholder bell rises or falls and the ice rotates, it is readily sheared off from the pipes.

The gasholder bell *a* is spirally-guided in the stationary tank *b* to rise and fall in the usual way. The surface level of the water is indicated at *c*. The vertical gas inlet pipe *d* consists of central sections mounted coaxially with the holder tank *b*, and is surrounded by the annular vertical gas outlet pipe *e* also coaxial with the tank *b*. The pipes *d* and *e* communicate respectively with oppositely-directed horizontal pipes *f*, *g* at the bottom of the tank *b*. Both pipes *d*, *e* project slightly above the water surface, of course, but the gas inlet pipe *d* projects slightly above the top of the outlet pipe *e* to provide for proper mixing of the gas in the bell *a*.

Control of Benzole and Coal Spirit (No. 2) Order

The Minister of Fuel and Power, in pursuance of Regulations 55 and 55AA of the Defence (General) Regulations, 1939, has made the Control of Benzole and Coal Spirit (No. 2) Order, 1944.

Part I of the Order, which comes into force on Oct. 1, contains certain amendments of the Control of Benzole and Coal Spirit Order, S.R. & O. 1944, No. 172. The amendments, which consist chiefly of slight relaxations in certain of the provisions of the principal Order, are mentioned in the Explanatory Note printed with the Order.

Part II of the Order, which came into force on Sept. 1 contains provisions as to the prices at which toluene may be sold or supplied and replaces the *price* provisions hitherto incorporated in the Control of Toluene Orders made by the Ministry of Supply. The disposal and acquisition control of toluene, toluole, and any material containing 40% or more of toluene is retained by the Minister of Supply.

All applications for licences and permits and any communications about the Control of Benzole and Coal Spirit (No. 2) Order, must be addressed to the Ministry of Fuel and Power, 7, Millbank, London, S.W. 1.

The Order has been published as S. R. & O. 1944, No. 988. Copies may be purchased from any bookseller or direct from His Majesty's Stationery Office.

The Employees of the Herne Bay Gas Company and their ladies thoroughly enjoyed a social evening arranged by the Sports and Social Club of the Company on Aug. 14. A number of employees of the Broadstairs Gas Company, which is under the same management, were the guests of the evening. Mr. A. Wells, Engineer of the Company, announced that opportunity would be taken to present gifts and Certificates for long and faithful service. Mention was made of the fact that three of those qualifying were sons of Mr. Jack Griggs, who spent 48 years with the Company, most of the time as General Foreman. Mrs. Wells made the presentations. Mr. G. S. Wareham, Secretary to the Company, proposed a vote of thanks to Mrs. Wells.